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Thank you for inviting me to discuss this very important topic of asbestos and disease with you here today. My name is Dr. Richard Lemen. I am retired from the United States Public Health Service where I was Deputy Director and Acting Director of the National Institute for Occupational Safety and Health (NIOSH). When I retired I also was an Assistant Surgeon General in the United States Public Health Service. I have spent my entire career, since 1970, studying the epidemiology of asbestos related diseases and have conducted numerous epidemiology studies, written many scientific papers, advised the World Health Organization, various other national governments, and have testified before Congress on several occasions concerning the health risks from exposure to asbestos. My CV, which I have supplied, the Committee will give you further information if you so desire concerning my studies on asbestos.

## **FACTS**

In the United States it is estimated that between 189,000 and 231,000 deaths have occurred since 1980 due to workplace exposure to asbestos. Another 270,000 to 330,000 deaths are expected to occur over the next 30 years and for those workers exposed, over a working lifetime, to the current Occupational Safety and Health Administration (OSHA) standard of 0.1 fibers/cc 3.4/1000 workers will die as a result of asbestos related diseases. Given that the National Institute for Occupational Safety and Health (NIOSH) estimates, as of 1990, the latest figures available, that some 363,000 men and 32,000 women are exposed at work, the future mortality from asbestos related disease will continue to occur well into this new millennium.

If deaths of workers exposed to asbestos in the United States at the current occupational standard are anywhere near the magnitude just expressed, what then would be the magnitude of disease and death to the countless number of unsuspecting consumers using asbestos containing products? These products include such things found in the home as lamp sockets, floors, cat box fill, braking mechanism in washing machines, furnaces, dishwasher, and other products.

Why then is any form of asbestos still allowed in commercial products within the United States, or the rest of the world for that matter? The Environmental Protection Agency produced a list of at least 44 suspected asbestos-containing materials. Within their list were cement pipes, used still for the transport of portable drinking water, friction products such as brakes, to name just two widely used commercial products. Imports of asbestos containing products still arrive into the United States each year and include such things as asbestos containing corrugated sheet, sheet panels, tubes & pipes, brake linings, where imports alone have gone up in the last 4 years from \$59 million in 1996 to \$89 million in 2000. Asbestos textile products are still coming into the US such as yarn & thread, cord & string, knitted material, clothing and they appear to be increasing each year according to the United States Geological Survey (USGS).

The most recent Criteria Document from the World Health Organization's (WHO) International Programme for Chemical Safety (IPCS) states in 1998 that no threshold has been identified for carcinogenic risks. This is consistent with the WHO's earlier conclusion in 1989 *A/T]he human evidence has not demonstrated that there is a threshold exposure level for lung cancer or mesothelioma, below which exposure to asbestos dust would not be free of hazard to health*®. The WHO recognizes what NIOSH concluded 25 years ago, in 1976, that A. . . (only a ban can assure protection against carcinogenic effects of asbestos)®.

Asbestos is a term for industrial and commercial use rather than a mineralogical term. The principle commercial forms of asbestos fall into two mineral groups. The most widely exploited has been the mineral named chrysotile which fits into the serpentine mineral group accounting for over 98% of commercial asbestos usage. The other principle mineral group, the amphiboles, contains amosite, crocidolite and anthophyllite. Other asbestiform minerals that fall into the amphibole mineral group are tremolite and actinolite, which occur in nature though they are rarely used, as large deposits are rare. Tremolite has been found as a contaminant of most commercial deposits of chrysotile and some talc. Tremolite has also been found as a contaminant of other minerals such as vermiculite while actinolite has been found as a contaminant of amosite from South Africa.

Asbestos has been responsible for a massive epidemic of disease and death since its commercial exploitation primarily beginning at the turn of this century. As we enter the new millennium we do not want to promote the myth, as is currently promoted by parties interested in the continued commercial exploration of chrysotile, that only one mineral group of asbestos, the amphiboles, were responsible for the disease and death associated with asbestos usage?

**The fact that Austria, Belgium, England, The Czech Republic, Chile, Denmark, El Salvador, Finland, France, Germany, Iceland, Italy, Latvia, the Netherlands, New Zealand, Norway, Poland, Saudi Arabia, Sweden, and Switzerland have all banned asbestos, leads us to recognize that these countries feel the safe use of all forms of asbestos is not attainable and that alternative materials posing less risk to public health are desirable.**

Further substantiation that asbestos cannot be used safely comes from the most recent International Programme for Chemical Safety Environmental Health Criteria 203- Chrysotile Asbestos. The document concluded "Exposure to chrysotile asbestos poses increased risks for asbestosis, lung cancer and mesothelioma in a dose dependent manner. No threshold has been identified for carcinogenic risks." It further warns that "Some asbestos- containing products pose particular concern and chrysotile use in these circumstances is not recommended." "Construction materials are of particular concern for several reasons. The construction industry workforce is large and measures to control asbestos are difficult to institute. In- place building materials may also pose risks to those carrying out alterations, maintenance and demolition. Minerals in place have the potential to deteriorate and create exposures."

The conclusions of the IPCS are very consistent with the evaluation of 'the amphibole hypothesis carried out by Stayner, Dankovic and myself in 1996. However, there are still today others that claim chrysotile asbestos is not as harmful as the amphiboles and can be used safely and should not be banned. We are at a point in the history of asbestos usage where chrysotile is the predominant type asbestos produced and consumed in the world today; it constituted about 98.5% of US consumption in 1992. While it is true that asbestos consumption has declined in both the

US and Europe, sales to other countries (e.g., Southeast Asia, South America, and Eastern Europe) has increased based on its usage in construction materials, the very materials that IPCS has warned against using. A

review of the lung burden, epidemiologic, toxicologic, and mechanistic studies, lead to the conclusion that chrysotile asbestos exposure carries an increased risk of both lung cancer and mesothelioma and that the hypothesis that these observations may be attributable to trace amounts of tremolite, an amphibole, a contaminant of the chrysotile may seem to be primarily of academic interest, because chrysotile exposures to workers and the public are also contaminated with tremolite.

### **CONTRIVERSITY OVER ASBESTOS FIBER TYPES (AMPHIBOLE HYPOTHESIS)**

The primary evidence for the amphibole hypothesis comes from pathologic studies in which lung burdens were measured. However, interpretation of these studies is hampered by the fact that chrysotile lung burdens are a poor reflection of integrated exposures and the fact that chrysotile exposure is highly correlated with lung burden of the amphiboles (e.g., tremolite). In addition, that pattern of asbestos fiber deposition in the lung does not appear to be consistent with the pattern of deposition in the target tissue (i.e., pleura).

A review of 92 consecutive cases of mesothelioma found that even while only 28.3% of the asbestos fiber type in the lung was chrysotile, it was the major fiber type identified in the mesothelial tissue itself. These findings further suggest that lung burden analysis for determining fiber type in mesothelioma etiology may not be appropriate and that determining predominate fiber type in the mesothelial tissue is the more rational determinant.

Some, with an interest in promoting the use of asbestiform materials in commercial products such as brakes, lawn products, talcs, and other uses want exemptions because they say their products contain cleavage fragments, which are not asbestiform. The facts are that cleavage fragments are almost never found in pure form and usually grow along with asbestos fibers in the same ore series.

In fact asbestiform particles of the right size can cause disease and are therefore biologically active. It has been reported that Libby Montana vermiculite miners and the New York talc miners show the occurrence of asbestos related cancers, which can be explained no other way than their contamination with tremolite or with other particles of appropriate size to induce disease. These diseases are not going to be limited to just the miners, but will pass on to the consumer of these vermiculite and talc containing commercially available products. These are just two examples of consumer products containing deadly particles. There should be an all out effort by the Consumer Product Safety Commission (CPSC), the Environmental Protection Agency (EPA) and any other governmental agency whose mission is to protect the public's health to identify and order removal of such cancer causing particles.

### **HISTORY**

I am attaching to my testimony a more detailed chronology of the usage, diseases, risks of disease and regulatory activities for asbestos, which are contained, in my AAsbestos Timetables®. But I would like to give you a brief few highlights from that history.

The use of asbestos dates back thousands of years when asbestos fibers were being incorporated into pottery as early as 2500 B.C.. The modern industry dates from about 1880, when asbestos was used to make heat and acid resistant fabrics. By the late 1800's and early 1900's the use of asbestos was being widely advertised. Johns-Manville ran full-page advertisements in several

publications, like the January 13, 1906 issue of *The Saturday Evening Post* saying AServes More People in More Ways than any Institution of its kind in the World.® Highlights in the production history of asbestos include its use as heat insulation as early as 1866; asbestos cement used as a boiler covering in 1870; commercial production of asbestos insulation materials in 1874; the first processing of Canadian asbestos into textiles in the U.S. in 1890; asbestos cement production in the U.S. began in 1903; flat asbestos cement board was produced in the U.S. in 1904; asbestos was first used as a brake lining in 1906; the first pipe making machines were imported into the U.S. in 1928; and asbestos spraying first began in tunnels in 1932.

### ***LUNG DISEASE***

The first recorded case of asbestosis was reported, in London, by a Charing Cross Hospital physician Dr. Montague Murray, in 1906. It is interesting to note that Adelaide Anderson, Lady inspector of Factories included asbestos among the dusts known to cause injury to man, in a 1902 publication on dangerous industries in England. In 1912 the American Association for Labor Legislation mentioned asbestos related disease in their Industrial Diseases, as did the government of Canada Department of Labour. In 1918, American and Canadian insurance companies would not insure asbestos workers due to the un-healthful conditions in the industry. The first complete description of asbestosis, including the naming of the disease and a description of Acurious bodies®, observed in lung tissue, appeared in 1924 and 1927 respectively. In 1930 the first case of asbestosis in the United States was reported and in the same year it was reported that Aasbestos bodies® were found in the sputum of asbestos exposed workers. By 1930 it was clearly recognized that people exposed to asbestos dust developed the disease Aasbestosis. In 1933 a report even carried the case of asbestosis in a 10-year-old rough-haired terrier dog used as a ratter in an asbestos factory. A study reported in 1936 asserted that continued exposure to asbestos could increase the fibrosis (lung scarring) in existing asbestotics and reported some evidence that asbestosis develops more rapidly in younger persons. In the early 1960-s reports of asbestos related disease began be reported in persons not directly exposed to asbestos, but who resided with asbestos workers or lived near sources of asbestos. Asbestosis is a progressive disease which can continue to worsen even after secession of exposure.

Asbestosis is not specific to humans and has occurred in animals other than under experimental situations. Besides the terrier described above, reports have described asbestosis in donkeys hauling asbestos ore. Environmentally induced asbestosis has also been found in field rats living in and around an asbestos mill and also in baboons living near an asbestos mill.

### ***CANCER OF THE LUNG & MESOTHELIOMA***

In 1935, in the United States and in the United Kingdom, reports of asbestos exposure with lung cancer appeared in the scientific literature. German physicians began calling lung cancer an occupational disease of asbestos workers. Epidemiological evidence in 1955, showed a ten-fold excess of lung cancers in those United Kingdom asbestos textile workers who had been employed before 1930, thus establishing the epidemiological link between asbestos exposure and lung cancer.

Between 1943 - 1946 reports of pleural (chest) and peritoneal (abdominal) tumors (mesotheliomas) associated with asbestos exposures appeared. In 1960 a major study of miners, millers, and transporters of asbestos and of non-mining residents found 47 cases of pleural mesothelioma, occurring between 1956 and 1960, one part of South Africa, the northwestern portion of the Cape Province, known to have many asbestos mines. Their study confirmed

epidemiologically an association between exposure to asbestos and mesothelioma. The fact that environmental exposures were also occurring demonstrated the fact that low-level, non-occupational exposures to asbestos could be hazardous. The first studies in the United States, to report mesothelioma with asbestos exposure were of factory workers, in 1963 and in 1964, of insulation workers.

With all of the scientific data and knowledge about asbestos, why is it still allowed in commercial products for general consumer usage, such as brakes, lawn products, cement pipes and others? We have seen the toil on workers mining asbestos, manufacturing asbestos, and using asbestos containing products. What will be the toil on the American consumer if asbestos continues to be allowed in commercially available products and American workplaces? **Now is the time for the United States to join the growing list of Nations that have banned the further importation and use of asbestos.** Asbestos related diseases are a result of human exploitation and only through stopping such exploitation can we take them away. Many responsible industries have taken this action, while others have not. Unfortunately, because some industries are unwilling to take such action for what ever reason, it is up to the Government to act. Asbestos is a deadly substance and has been known to be so for almost 100 years and we know that suppression of the asbestos containing dust will not work, as no thresholds for cancer can be established, and that even at the lowest standards to date excessive disease and death will continue to occur, there is no choice but to **BAN** this deadly substance, **ASBESTOS**, from commercial use if we are to stop this continuing epidemic of disease and death. I conclude by quoting the very eminent British public health statistician, Sir Bradford Hill who said in 1965 - **AND I MIGHT ADD THIS STILL APPLIES TODAY: *All scientific work is incomplete - whether it be observational or experimental. All scientific work is liable to be upset or modified by advancing knowledge. That does not confer upon us a freedom to ignore the knowledge we already have, or to postpone action that it appears to demand at a given time.***@

**THAT TIME IS NOW AND THE ACTION WE MUST TAKE IS CLEAR.**

